

**KWAME NKURUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI
GHANA**

**Factors Influencing Construction Quality in Ghana: Comparison of Designer's and
Contractor's Perspectives**

By

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**A Thesis Submitted to the Department of Construction Technology and Management,
College of Art and Built Environment in partial fulfillment of the requirements for the
degree of**

MASTER OF SCIENCE

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DECLARATION

I hereby declare that this submission is my own work towards the MSc.in Project management and that, to the best of my knowledge, it contains no material previously published by another person, nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text.

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ABSTRACT

In the construction industry, projects are mostly anticipated to establish an equilibrium amongst project time, cost and quality. Achieving quality when carrying out construction project is the ultimate objective among others to every stakeholder. Quality of construction execution plays a crucial role in determining the acceptance of construction project by clients and resultant contractual payment levels. This has enlighten construction industry stakeholders to be conscious of quality as a relevant objective in attaining client satisfaction and achieving competitive advantage. In this thesis, by gathering relevant research findings, aims to investigate factors influencing construction quality in Ghana from perspectives of the designer and contractor. Four objectives were set on which literature review was conducted which includes: determining whether designers and contractors equally consider design quality important in setting the overall quality of project, identifying the causes of poor construction quality in Ghana, identifying whether there are difference in the perspectives of designers and contractors on the causes of poor construction quality and identifying potential solutions to improve construction quality. Quantitative method was adopted in which survey questionnaires were administered to respondents to gather primary data obtaining a sample size of 52. The analytical tool utilized was Descriptive statistics. The findings of the research indicated that both designers and contractors equally consider design quality important in setting the overall quality of project. Also, Out of the findings of the research conducted, it indicated that: Lack of proper supervision from architects, Use of low quality materials, Change orders, Poor communication among project participants and Poor planning and scheduling are the most significant causes of poor construction quality. More so, it was established that Good site working conditions with proper inspection, Constructability of design, Competence and experience of project team members, Quality materials in construction and Efficient teamwork and cooperation are the most significant potential solutions to improve construction quality. It was recommended that designers must be encouraged to put in their best during the designing stage of construction projects since design quality is important in setting the overall quality of a project. Moreover, contractors must also be engaged in designing stage of project to contribute to feasibility and constructability of project design.

Keywords: Construction quality, Contractor, Designer, Project.

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Finally to all those whose names are not mentioned here, even though their contributions and support are part of this success story, I say a big Thank you.

DEDICATION

This dissertation is dedicated to the Almighty God for his mercies, my mum who laid the foundation for my education, all my family members, friends and loved ones most especially my wife.

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CHAPTER ONE

GENERAL INTRODUCTION

1.1 BACKGROUND OF THE STUDY

In the construction industry, projects are mostly anticipated to establish an equilibrium amongst project time, cost and quality. Project's quality may be referred to as satisfying a project's functional and aesthetic desires (Collins, 1996). The requirements of project could either be complex or simple and can also be specified in relation to final outcome expected. Quality is achieved when adequate desires of a project are stated and when finished project measures up to specification. Some professionals who are designers believe that the aesthetics of facilities design by them can be measured by quality. This traditional perception of quality in the view of Stasiowski and Burstein (1994) have its bases on matters including how a building integrate well with its environment, the psychological influence of a building on occupants, the usage of the concept of bold new design which captures the imagination of individuals and the ability of landscaping design to match the theme of adjoining buildings. Also, quality can be viewed in terms of function by how projects conform to their stated requirements.

Quality management is of the concept to ensure efforts in achieving required quality level for products which have been adequately planned and well organized. Quality in construction may be referred to achieving designer, constructor and owner project desires as well as satisfying regulatory agencies. From a construction company point of view, quality management of projects is a means of meeting the required standard of projects in other to gain customer satisfaction which may enhance continuous effectiveness and subsistence in business (Tan and Abdul-Rahman, 2005).

Furthermore, achieving quality when carrying out construction project is the ultimate objective among others to every stakeholder (Ofori, 2006). Quality of construction execution plays a crucial role according to Battikha (2002) in determining the acceptance of construction project by clients and resultant contractual payment levels. This has enlighten construction industry stakeholders to be conscious of quality as a relevant objective in attaining client satisfaction and achieving competitive advantage. Therefore it can be deduced that in construction, quality performance have its basis on end product and requires confirmation of awareness of quality during execution and outcome by project team. The improvement of performance of quality is expected to enhance contractor's productivity and profitability as well as satisfying client's requirements.

The construction industry is mostly project based with characteristic of varying complexities of projects undertaken. In management of construction projects, principles of quality management are crucial necessities in accommodating adequately production variability, comparative to the various interest of numerous construction project stakeholders involved, and according to Love *et al.* (1999) the absence of it could end in regular changes, omission and errors.

Therefore, according to Josephson *et al.* (2002) the absence of quality engagement throughout construction supply-chain could end in poor quality operations. Moreover, in construction projects, the aspects of productivity and performance can be affected negatively due to poor quality management.

1.2 PROBLEM STATEMENT

Construction industry in the last decades has faced many criticisms due to its productivity and performance as compared to other industries. In construction, there is the challenge of attaining an acceptable quality level of projects. Due to inefficient or absence of procedures of quality management, each year huge expenditures of money, time and resources are put to waste (Ashokkumar, 2014). Also, in construction according to Battikha (2002), due to its highly complex, dynamic and competitive environment, satisfactory level of quality of projects have been an issue for a period of time in achieving on time and within budget. Ali and Wen (2011) emphasized that in construction, poor project quality is a commonly known occurrence. Also, construction projects quality level as stated by Kazaz and Birgonul (2005), has not been attained which is a prevailing problem in the industry. Therefore, aiding companies in the construction industry in identifying issues contributing to failure in the quality of project desired and also finding ways of improving the success of attaining quality project has motivated the conduct of this research. It is of the view that project success factors intensification and its failure factors reduction should enable the realization of construction industry quality goals.

Nevertheless, construction projects inadequate quality is a global occurrence and has been subject of many studies. The Ghanaian construction industry is not immune from this phenomenon and has been fraught with poor project performances resulting in building collapses and other consequences. The design phase of a project is the phase where ultimate quality of the constructed facility is quantified and defined through the production of construction documents. As such, any attempt to improve construction quality should start with the improvement of design quality. This study therefore seeks to investigate on factors influencing construction quality a comparison of designer's and contractor's perspectives.

1.3 RESEARCH QUESTIONS

The study pursues to answer the questions as follows:

1. Do designers and contractors equally consider construction design quality important in setting the overall quality of project?
2. What are the causes of poor construction quality in Ghana?
3. Is there any differences in the perspectives of designers and contractors on the causes of poor construction quality?
4. What are the potential solutions to improve construction quality?

1.4 AIM OF THE STUDY

The aim is to investigate factors influencing construction quality in Ghana from perspectives of the designer and contractor.

1.5 OBJECTIVES OF THE STUDY

To achieve the study's stated aim, this specific objectives were advanced:

1. To determine whether designers and contractors equally consider construction design quality important in setting the overall quality of project;
2. To identify the causes of poor construction quality in Ghana;
3. To identify whether there are differences in the perspectives of designers and contractors on the causes of poor construction quality; and
4. To identify potential solutions to improve construction quality.

1.6 RESEARCH METHODOLOGY

Methodology which was engaged in undertaken the study is the quantitative research approach. The research commenced with the conduct of a literature review by collecting secondary data from textbooks, journals and previous research works. Questionnaires were the research tool utilized to gather primary data from respondents. Statistical Package for Social Sciences (SPSS) was engaged to analyze retrieved data using Descriptive statistics technique.

1.7 JUSTIFICATION OF THE STUDY

In this study knowledge in the aspect of quality management in the construction industry was presented. It provides relevant information on the causes of poor construction quality in the construction industry and further seek if there are difference in the perspectives of designers and contractors on the causes of poor construction quality. Moreover, this study explored and make awareness of the potential solutions to improve construction quality. Nevertheless, the study add to knowledge in the area of quality management in the construction industry and also assist other researchers who may engaged in research in this line of study.

1.8 SCOPE OF THE STUDY

Geographically, although the study conduct concerns to all construction stakeholders in Ghana, the scope of the study was restricted to contractors and architects currently undertaken a project on site at the time of survey located in Greater Accra region from well-known and reputable construction companies. This is because majority of construction firms primarily operates in Accra. Also, given that economic growth is largely skewed towards the capital in the Greater Accra region. Hence, it is expected that the data to be obtained from the study gives a broader perspective of factors influencing construction quality.

1.9 RESEARCH ORGANIZATION

The study were in five chapters with the first chapter, thus chapter one highlighting on the research background, statement of problem, study aim and objectives as well as research questions, study's scope, justification and methodology. Chapter two throws lights on literature review comprising earlier works concerning the subject of quality in the construction industry. In chapter three, research methodology was presented including population and sample size consideration, data collection procedures and instrumentation that was used to gather data for the study. Chapter four elaborate the analysis on findings and made discussion on findings of the study. The final chapter, thus chapter five summarizes the findings obtained and gave recommendation for further study conduct.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

Review of extant literature, which is in relation to the study is presented. It contextualizes quality within the construction industry; quality management; concepts of quality management; factors that affect construction project quality; construction project quality improvement factors.

2.2 OVERVIEW OF QUALITY IN THE CONSTRUCTION INDUSTRY

The definition of the quality of project can simply be referred to meeting expectations and project desires of customers. It can also be referred as abiding by project specifications and requirements. In actual practice quality performance is challenging despite definitions and requirements followed for project quality. Quality of a project in the view of a user is simply appeasement with performance, appearance and project been reliable for its cost (Collins, 1996). More so, quality is conformance to aesthetic, legal and required project performance. The requirements of project could either be complex or simple and can also be specified in relation to final outcome expected. Quality is achieved when adequate desires of a project are stated and when finished project measures up to specification. Some professionals who are designers believe that the aesthetics of facilities design by them can be measured by quality.

This traditional perception of quality in the view of Stasiowski and Burstein (1994) have its bases on matters including how a building integrate well with its environment, the psychological influence of a building on occupants, the usage of the concept of bold new design which captures the imagination of individuals and the ability of landscaping design to match the theme of

adjoining buildings. Also, quality can be viewed in terms of function by how projects conform to their stated requirements. Quality management is of the concept to ensure efforts in achieving required quality level for products which have been adequately planned and well organized. Quality in construction may be referred to achieving designer, constructor and owner project desires as well as satisfying regulatory agencies. From a construction company point of view, quality management of projects is a means of meeting the required standard of projects in order to gain customer satisfaction which may enhance continuous effectiveness and subsistence in business (Tan and Abdul-Rahman, 2005).

In addition according to Abdel-Razek, *et al.* (2001), currently as a result of frequent changes in construction there is popularity on the subject of attaining quality. Also, customer satisfaction has become the recent definition of quality to the past definition of quality as compliance to standards. The methods to ensuring quality developed from quality control to management of quality through the assurance of quality which arrived at policies including Total Quality Management. In many countries who are developed, with systems of quality established have their ultimate goal of producing quality as an end product and not control the quality of end product (Abdel-Razek, *et al.*, 2001). The recent methods are of relevance not to the customer only but to manufacturers since quality cost is enhanced to reduce loss in total cost.

The resultant therefore becomes reduced cost and improved quality, market increased share and maximization of profits (Abdel-Razek, *et al.*, 2001). Barrett (2000) stated that quality is known to be costly in construction mostly when project operations are not effective, remedies to defect works increase in cost if assurance of quality is not considered. Nevertheless, quality in civil and building works should be assimilated in project design stage and project construction stage in the appropriate way to ensure satisfactory project outcomes. Atkinson (2005) asserted that lots of

building failures and defects emanate due to inadequate attention placed on quality during the designing phase of the building and more so the operational works carried on the building project.

Management of the quality of a product according to Harris *et al.* (2006) has progressed from responding to activities on site to strategic business operation which accounts for the sustenance of construction companies. A company in construction can only be sustained in recent modernized market if it can assure its clients of product which is of the required and desired quality by the client.

2.3 QUALITY MANAGEMENT

Management of quality is of the aim to ensure ways in attaining the desired quality level of product appropriately planned and well organized. In construction management of quality can be traced from Rome and Greece in ancient times (Olatunji *et al.*, 2012). Management practices to ensure quality involves the various ways managers anticipate by effort of quality policies implementation. These activities carried out by managers involves planning, controlling, assurance and improving quality of products (Harris and McCaffer, 2001). A crucial factor to ascertain the acceptance of final project is its quality which also influence the magnitude of payment.

As a result construction participants are now careful and conscious of quality due to its relevant role it plays as a way of attaining satisfactory of clients and also ensuring sustenance in business. It has been established that there are difficulties in attaining desired quality within project budget and time in a competitive, complex and dynamic environment (Battikha, 2002). Furthermore, the incorporation of quality management has practiced by companies in the construction industry to resolve problems that rise due to quality and meet the desired requirements of customers (Kanji and Wong, 1998). Oakland and Aldridge (1995) stated that total quality management of projects

is very necessary in the construction industry. In determining if project has performed successfully or has undergone failure, quality remains the primary suspect among other various factors. In recent times according to Feigenbaum (1993), the various parties engaged in construction due to the time consuming factor of developmental projects, has resulted in striving to achieve projects that are acceptable and of desired quality. It can be said that improving quality performance ensures increased profitability and productivity of project participants and also ensures satisfaction of customers (Yasamis *et al.*, 2002).

2.3.1 Importance of Managing Quality of Construction Projects

Managing the quality of all activities involved in the execution of project in construction breeds considerable benefits to both the performance of the project as well as the well-being of organization undertaking the project. Effectively and efficiently ensuring quality increase the profit margins of organizations and further maintains their credibility of ensuring desired client requirements therefore sustain their competitiveness in the industry (Ashokkumar, 2014). When quality is ignored in processes of project execution results in the following unfavorable situations:

Increases the cost of financing the project; Loss of regular inflow of cash; Undesired quality of final product; Results in claims of liquidated damages; Occurrence of reworking after project has been completed; and Minimize the progress of work and results in time overrun of project (Chin-Keng and Abdul-Rahman, 2011). Throughout the life stages of a project ensuring appropriate and efficient quality management leads to quality final product of projects. For a project quality performance to be attained the designing and construction stage must be paid much attention since these phases are critical to project quality performance (Ashokkumar, 2014).

2.3.2 Guiding Principles of Managing Quality

Evans and Lindsay (2008) established three guided principles which ensures project quality performance. They describe these principles as

1. Profile and qualities of project stakeholders and clients;
2. Project team working, commitment and participation; and
3. Established culture of continual learning and improvement.

2.3.3 Concepts of Quality Management

Concepts of quality management involves quality assurance, quality improvement, quality management systems, quality planning and quality control. These concepts are further discussed below:

2.3.4 Quality management systems

The means of attaining project quality is through the systems of quality management which implies conforming to requirements which are been established. Systems of quality describes the structures in an organization, processes and procedures to follow, resources to be engaged and assigned responsibilities to implement and manage project quality. Burati *et al.* (1992) stated that, these systems may further be attributed to activities established to be utilized in constructing projects which involves evaluation and prevention actions. Establishing quality systems gives benefits to both organization and client as a result of ensuring that projects delivered meets client's expectation and increases organizational profit margin since project resources will be used efficiently.

2.3.5 Quality Planning

Quality planning refers to a number of activities aimed at defining objectives, policies, requirements for quality systems. Quality planning further makes clear or describe how to apply the set policies, ways of arriving at requirements and ways of achieving the objectives. Goals of quality is defined by quality plan, moreover quality plan is practical and accurate on the main sources of defects, and provides methods and approach which are effective and appropriate. During quality planning it must aim at primary to satisfy clients requirements and desires; the plan must provide preventive measures rather than inspecting results and rendering corrections when defects arises; seeking improvement through continual skills training and learning (Construx, 2003).

2.3.6 Quality assurance

Quality assurance aims at doing the right thing at the first instance. Assuring quality came into being due to dissatisfaction level that most clients encounter with their products. More so, to arrive at value for the money spent on a project, quality assurance must be implemented in the life cycle of the project (StudyMode.com, 2008). Companies who implement and maintain quality assurance throughout their operations gains a lot of benefits for implementing them such increased profit margins and company credibility.

2.3.7 Quality control

Controlling quality ensures that projects are undertaking in conformance to a set standard. The primary aim of controlling quality of a project is to ensure safety of the project and to see to it that there is sustainability and reliability of construction projects. Quality control breeds the benefits of project failure prevention. Quality assurance aims at examining quality and quality control brings out the outcome. The project is not altered when carrying out quality assurance but

controlling quality alters the project. Quality control are activities performed to ensure that project meets its requirements concerning quality (Harris and McCaffer, 2001).

2.3.8 Quality improvement

Quality improvement can be referred to as an approach to enhance quality by adopting techniques and practices. Improving the quality of a project aims to maximize the potentials in fulfilling requirements. In construction non-residential developers mostly engage the practice of improving quality to sustain in business. Total Quality Management comprises of the various quality improvement practices and techniques.

2.3.9 Philosophies in Quality Management

McCabe (1998) established quality management philosophies on ways to manage quality of a project, measure a project's quality and ways of improving project quality. He referred fitness of a project for use as quality and grouped quality into four groups as: design quality, conformance quality, quality of field service and availability. Design quality relates to specification of design and the concept of the product. Conformance quality involves resources such as materials, manpower and equipment's; technology implemented; and management practices. Quality of field service involves competence, promptness and integrity. Availability focus on maintainability, reliability and support from logistics. McCabe (1998) established the following management philosophies:

1. Creating awareness of opportunities to improve quality and the need for quality;
2. Establishing goals for proving quality always;

3. Establishing a council for quality and identifying quality related issues;
4. Providing skills training and continual learning to all members;
5. Execute projects to solve related problems and uncertainties;
6. Continual reporting on the progress of work;
7. Frequent communication of results;
8. Keeping tract and records of project success; and
9. Implementing an annual improvements of the processes and systems of the company.

2.4 CAUSES OF POOR CONSTRUCTION QUALITY

Projects undertaking in the construction industry are mainly complex and practices of quality management is very key in handling the production inherent variabilities. Absence of quality management practices cause regular variations, omissions and mistakes (Josephson *et al.*, 2002). Therefore absence of quality throughout the project life cycle causes poor quality in all project activities and these activities are considered to be adding no values to the construction project (Alwi *et al.*, 2002). Further, poor quality activities in construction projects results in overruns in project initial estimated cost and scheduled time. Project factors that results in poor quality of construction projects can be categorized into the environment of the project; procedures undertaking to management the project; the project client; project management team; and actions of project management team (Chan and Tam, 2000).

2.4.1 Client

The nature and qualities of the project client influence the quality performance of a project. The ability of the project client to brief its project requirements and desires helps to ensure quality at

the project designing stage. To ensure quality clients must be competent in decision making, have the ability of defining roles. Clients may either be from the private sector or the public sector. Factors of client that causes poor quality performance of construction projects includes: Inaccuracy of client stated requirement; and Frequent variations to requirements by project clients (Chan and Tam, 2000).

2.4.2 Project Characteristics

The quality performance of a project is greatly affected by its nature and characteristics. The complexities and scope of a project affects quality. The scope of the project defines how sophisticated the project entails in terms of the number of stories and the project type. The complexity of a project relates to the buildability of its designs, how easily the designs could be coordinated and whether the project requires specialized skills and technology involvement (Chan and Tam, 2000).

2.4.3 Project Environment

The environment of a project relates to influences which affects the project externally. These influences may be from the relations in the industry, economic issues, physical environment, political issues and socio-cultural issues. The environmental factor of the project creates risk and uncertainties to project quality management. Factors of project environment that causes poor quality performance of construction projects includes: Unfriendly project social environment; Negative political environment; Adverse conditions on project site and conditions of the climate; and Undesirable economic environment (Chan and Tam, 2000).

2.4.4 Project Team Members

In construction, the team members on a project refers to personnel's and professional in an organization that come together to accomplish the required project designs, planning and executing

the project. These team members may be from either one, two or even companies. The team members of a project may comprise of designers, contractors, sub-contractors and suppliers.

The experiences and skills acquired by project team members have influence on the project quality performance. Factors of project team members that causes poor quality performance of construction projects includes: Incapability of project manager, Incapability of design staff, Incapability of construction staff, Conflict among Project Participants, Lack of results feedback and frequent monitoring by participants, Absence of training on quality for staff, Lack of coordination between designers and contractors, Using labor with low experience, Lack of employee commitment and understanding, Lack of cooperation between Supervision and Contractor's staff, Lack of cooperation between contractor and material suppliers, Lack of project supervisors understanding of administration of the contract (Chan and Tam, 2000).

2.4.5 Project Procedure

The administration of a project involves various procedures and when the right and corrective procedures are not taken, project suffer in quality performance. In terms of the tendering stage, if project is awarded to the lowest bidder whose estimates are not accurate, influence the quality management of projects. This results in cost overruns as to the initial estimated cost and time overruns as work needs to be halt due to absence of cash inflow. Further, the contractor engage resources of low quality as to meet cost in terms of low skilled labor, materials and equipment's. Also, if project design is awarded incompetent designer results in project poor quality performance since the designing stage of the project sets the overall quality of the project. Factors of project procedures that leads to poor quality performance of construction projects includes: Inappropriate procurement adopted, Inappropriate tendering process (Chan and Tam, 2000).

2.4.6 Project Management Actions

The actions of team members involved in a project have significant influence on the quality performance of a project. Management actions are primarily to plan the project, execute the project while ensuring adequate monitoring and controlling. Factors of management actions that leads to poor quality performance of construction projects includes: Project designs inconsistency and incompleteness documentation; Inappropriate detailed drawings; Un-compliance to project standards and project codes; Project specifications un-compliance; Un-detailed and inaccurate Bill of quantity; Lack of comprehensive system for managing materials; Absence of quality materials on site; Lack of appropriate storage and handling system; Faulty Project Conceptualization; Poor Planning and control techniques; Poor financial control systems; incompleteness of engineering design manuals and guidelines; Ineffective quality control program; Unreasonableness project schedule; Lack of safety program; Absence of motivation system; and Absence of a culture for continual improvement in project quality (Chan and Tam, 2000).

2.5 PROJECT QUALITY IMPROVEMENT IN THE CONSTRUCTION INDUSTRY

Improving quality of a construction project should involve from the project conception stage to closure. That is quality management should be incorporated throughout the life cycle of the project. Various studies has been undertaken in diverse countries to address the issues which surrounds quality. For the success of project Chua *et al.* (1999) established a hierarchical model for diverse objectives of a project. With quality objectives of a project, it was ascertain by them that quality is subjective to four primary prospect of a project which are project contractual agreements, communication process of the project, characteristics of the project and participants of the project. It was further ascertain that factors that improve the quality of projects in construction includes:

- i. Commitment by management to enhance continual improvement in quality;
- ii. Engaging every personnel in quality training;
- iii. Leadership of management promoting high quality processes; and
- iv. Project participant establishing effective and efficient cooperation and team among themselves.

In a case study undertaken by Pheng (2004), revealed to the fact that Total Quality Management is a management philosophy in the service and manufacturing industry, however, when used in the construction industry will provide similar benefits. These benefits includes reducing the cost of quality and sufficient client and employee satisfaction on the job. Systems developed for quality assurance enhance quality of project consistency and is vital for preventing and eliminating problems and adverse situations reoccurrences (Bubshait and Al-Atiq, 1999).

Further, according to Harris and McCaffer (1995), a comprehensive quality system do not rely on control and inspection alone but also on a system which engage in:

- i. Frequent motivation of project participant to produce quality in their activities;
- ii. Ensuring effective communication of new instructions;
- iii. Ensuring favorable working conditions on site with regular inspection;
- iv. Diligently confirming remedied faults and errors;
- v. Accurately recording checks on work completed;
- vi. Establishing a system for documenting failed activities and successful ones;
- vii. Instituting authority and power to amend faults and errors;
- viii. Utilizing effective, safe and appropriate equipment's;

- ix. Utilizing appropriate and quality materials; and
- x. Engaging appropriate skills and continual skill training and learning.

Figure 2.1 below present's benefit of successful construction project by implementing quality management in construction projects and the significance derived from a successful construction project.

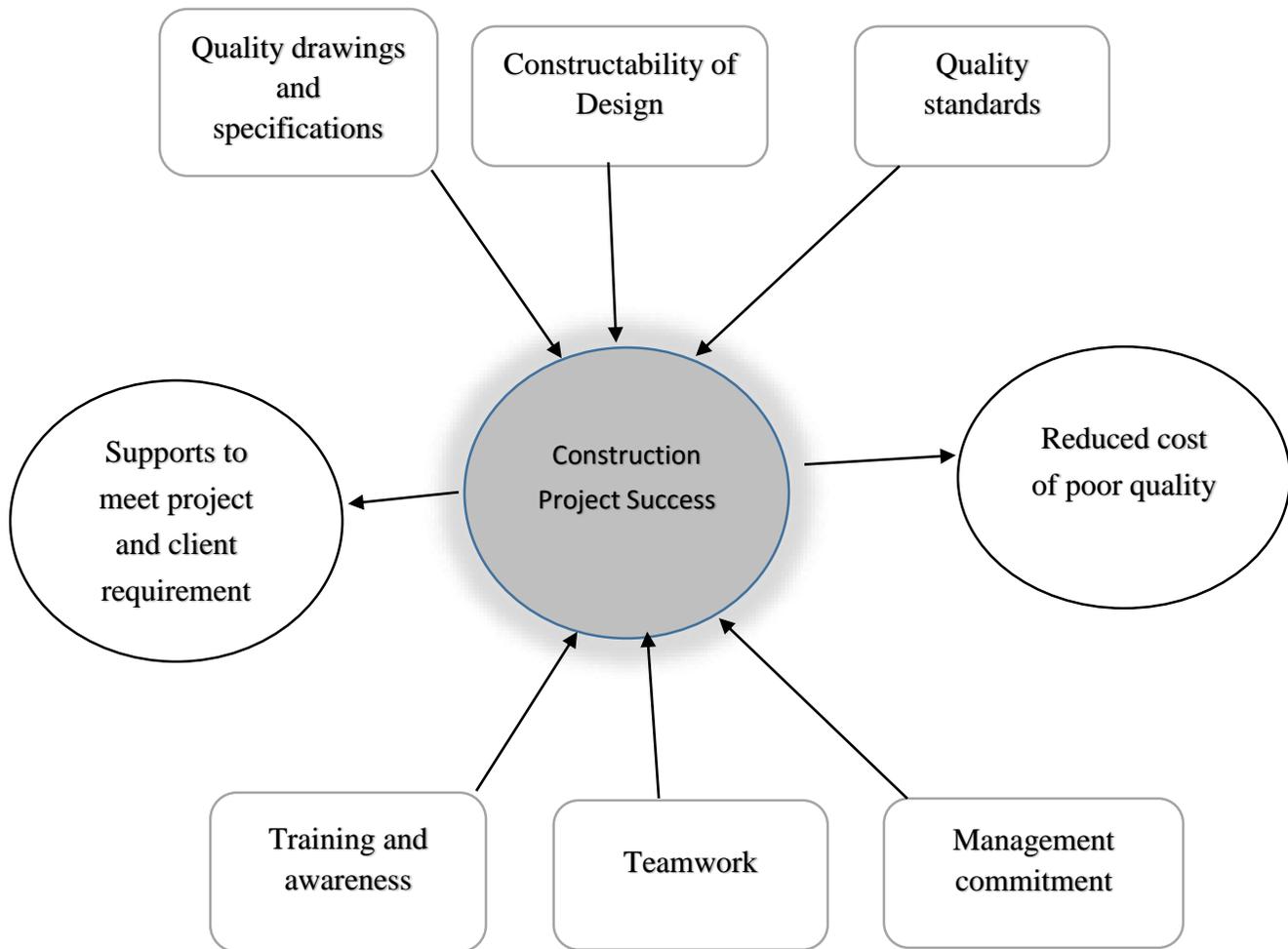


Figure 2.1: Framework of quality management for construction project success

Source: Author's construction

In summary, supervising a project in construction to achieve desired quality with a minimized incurred cost and time is of much concern recently. The reasons is that, for project requirements to be attain quality cannot be overlooked. Project quality must satisfy client's requirements and parties engaged in the project with much satisfaction. To the organization, irrelevant cost could be incurred due poor quality management. Therefore, it pronounce the need to implement quality throughout project activities.

Proper implementation of quality management plan is relevant at the conception phase of the project where, quality standard, quality designs and design constructability could result in enhancing the quality of projects. Nevertheless, management support and commitment is essential to sustain quality. Quality training and awareness introduce a base to coordinate all project participants into ensuring quality management which is relevant to the success of construction projects.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter is very vital to the conduct of this research as it is the pivot around which all activities of the research revolve. It comprises of the key strategy adopted for the research and its finding followed by the rationale for the adoption of such a strategy. The research design comprises of data sources which involves desk survey which aided in the identification of key research variables; questionnaire development, distribution and statistical tools for data analysis.

The primary objectives of choosing a research methodology and design is to give instructions to plan and conduct the study in a manner which will promote the attainment of set goals. According to Burns and Grove (1998), research methodology is the guide for undertaken the study. Also it can be referred as strategies and procedures engaged to collect and conduct a data analysis when conducting a research (Hungler, 1999). According to Christou *et al.* (2008), research methodology is an approach to gaining knowledge of the world, is about discovering ways of engaging in a task to access what is believed to be the truth. Research methodology involves designing, sampling, collection of data and conducting analysis on data retrieved.

3.2 RESEARCH APPROACH

Research approach refers the step by step procedures and action plans adopted for a research from the stage of general assumption up to data interpretation (Creswell, 2013). Two main approaches have been identified and named as the Deductive and Inductive research approach.

The Deductive approach deals with what is already known as existing theories or ideas about a subject by identifying the theory and testing through observation to confirm the theory (Creswell, 2013). This approach involves a top-down approach in the formulation of the theory and testing of hypothesis while maintaining the independence of the researcher. That is to say that, the process starts from the identification of the relevant theories and the use of scientific study through observations to confirm these theories. The research is therefore used to test specific propositions (Creswell, 2003).

On the contrary, the inductive approach is mainly used in theory building which begins with the study of specific instances of societal issues, through the identification and development of patterns from the analysis of data gathered (Creswell, 2013). It employs a bottom-up approach where through the study of specific issues to the broad generalization of the specific situation, qualitative research approach for data collection and analysis are subjective in nature (Kwofie, 2015). According to Saunders *et al.* (2009), the inductive approach most often relies on the collection of qualitative data. Fisher (2010) also emphasized that theories are derived from the generalization of the specific phenomenon in the inductive reasoning.

This research is based on deductive approach as it involves the use of already existing theories together with quantitative methods to make inference into mergers and acquisition. That is the study first reviews literature as a theoretical guide, and then collects data from participants. Hereafter, statistical techniques will be used to draw diverse meanings and interpreted within the context of the already existing theoretical framework. The results of this deductive method will be observations and findings unlike the inductive, which will be theories.

3.3 RESEARCH METHODS

The design of a research deals with framework that will be used to collect data and make analysis to these retrieved data. It serve as guide to execute the technique to collect and analyze data. It further provides connections between data which are empirical and provides a logical sequence to make conclusions to the study's research questions. Case study, experimental, action research and survey are the forms of research design (Yin 2003; Blismas, 2001; Bryman, 2005). Survey as a form of research design was engaged in the conduct of the study. Due to the need to generalized research finding across the construction industry, a survey questionnaire was adopted. Oppenheim (2003) stated that the utilization of a survey questionnaire improves replication and give reliability of observation due to its in-built uniform measurement and sampling techniques.

3.4 RESEARCH STRATEGY

According to Baiden (2008), in conducting a study it is relevant to clarify the researcher's orientation. The research strategy dwells on the manner in which the objectives of the study are questioned. Qualitative, triangulation and quantitative are the three main strategies. Naoum (2002) stated that, the choice of engaging a particular research approach is dependent on the study's aim and also type of information available for the conduct of the study. This research follows a quantitative strategy by the utilization of survey questionnaires to elicit data from respondents. The quantitative strategy is suitable for this research because of the desire of the researcher to measure the opinions of respondents using scientific basis (positivist) approach. By adopting the quantitative strategy, the researcher was entirely detached from the research phenomenon unlike the other strategies like the qualitative strategy. It is envisaged that construction project quality are phenomenon experienced by managers of construction firms.

3.5 POPULATION OF THE STUDY

In every research, defining the population of the study is very essential. The population of the study defines the actual group the study is interested in. The population of target is the whole combination of respondents that meet the established research criteria (Burns and Groove, 1997). Population of a study may comprise of members in an organizations, villages, places or events selected due to their significance to the achievement of research set objectives. The study limits its target population to contractors and architects located in the Greater Accra region of Ghana. The population chosen was as a result of their frequent engagement in many developmental projects in Ghana. With this a more consistent and reliable information can be presented.

3.5.1 Sample Size and Sampling Technique

In the conduct of the research, sampling technique utilized was purposive sampling technique due to the fact that the researcher decided on the group of respondents required to be involved in the study being conducted. The researcher decides what needs to be known and sets out to find people who can and are willing to provide the information by virtue of knowledge or experience. In order to evaluate and assess the quality of construction works, contractors and designers in the Accra metropolis were targeted. A total of sixty – five (40) designers and twenty - five (25) contractors were considered. A sample size sixty – five (65) was considered in this study. Key respondent namely contractors and designers were identified using the purposive sampling technique. These category of respondents were engaged as a result of their various engagement in project management in the construction industry and it is believed that experiences in project quality management will enhance the reliability and validity of their responses giving.

Further, snowball sampling technique was adopted in selecting contractors and architects for the research due to the difficulties encountered in assessing the population size. The snowball sampling is techniques of locating respondents who are very visible for administration of questionnaires at first instance and based on a network from these initial respondents other key respondents are located for questionnaire administration. The reason for utilizing the snowball technique is as a result of the inability to easily locate respondents whose office or places of work cannot be located by the researcher with ease because of structural planning problems within the scope of the study.

3.6 DATA COLLECTION

3.6.1 Data Sources

In research study field and desk survey are the approaches to data collection. According to Fadhley (1991), desk survey involve the review of literatures and forms a relevant part of the conduct of the research as it provide the opportunity to gather data to develop questionnaires for dissemination to retrieve data from the field. Field survey is mainly collecting data from respondents using questionnaires developed from the desk survey. Desk survey culminated into the identification of key variables in quality management which were used in the development of questionnaires which were administered to respondents to collect data for analysis.

3.6.2 Questionnaire Development

According to Oppenheim (1996), for questions relevant to the study to be set, it is vital to initially establish the required information which needs to the gathered. In the development of the questionnaire, lots of considerations were made to ensure that respondents are able to easily read the questions and make meaning out of it to provide the required answers intended by the researcher.

This in the long run helped the researcher from wasting much time in data collection from the respondents. All the questions in the questionnaires were closed ended placed on a Likert scale of 1 to 5. The scale measures the intensity or strength of the opinion of respondents. The diction of the questionnaire was simple as jargons and other technical terms were very minimal in the crafting of the questions.

Similarly, the numbers of questions were kept minimal to encourage respondents to answer the questions. The questionnaire consisted of six (6) questions: the purposes of the first three questions were to determine profession, years of experience and construction industry sector of respondents. The fourth question sought to ascertain whether designers and contractors equally consider design quality important in setting the overall quality of project.

The fifth question sought to ascertain the impact of the variables identified in the literature review on construction project quality in Ghana. The last question explores potential solutions to improve construction quality.

3.6.3 Questionnaire Distribution

The 65 questionnaires were evenly distributed among respondents. Out of this 52 questionnaires representing 80 percent of the respondent gave response to the questionnaire administered. These retrieved questionnaires formed the basis for the conduct of the analysis. According to Coffey *et al.* (1996), the rate to the response of the questionnaire by respondents indicates the fraction of questionnaires completed by respondents. Moreover, he further stated that in literature a high rate of response from respondents indicates the study's validity of its findings.

From this statement it can be concluded that, the response rate of 80% is deemed adequate for data analysis to be conducted on data retrieved from respondents. The entire field survey was completed in two weeks and the higher rate of response from respondents can be accredited to the researcher constant follow ups on questionnaires for collection and also the ease of reading and understanding the questions by the respondents.

3.6.4 Data Analytical Tool

After the questionnaire retrieved they were prepared by coding and fed into the Statistical Packages for Social Sciences (SPSS version 16) for data aggregation and subsequent analysis. The type of variables obtained influence the test that will be adopted in the analysis of retrieved data. The variables can either be categorical variables, ordinal variable or interval and also if these variables are distributed normally. In this research both descriptive and inferential statistics was utilize in analyzing correlation between the various issues the literature identified. This study therefore employed percentages for the analysis of the background information while the mean scores as a measure of central tendency and the standard deviation as a measure of the dispersion were used in the measurement of the variables

3.7 RESEARCH ETHICS

The study observe to the ethical consideration for the conduct of the research. Respondents were briefed on the purpose of the study and what will be done with their responses given. They were assured of giving much confidentiality to responses provided by them and that their responses will only be engaged for the purpose of this research conduct.

Also they were given assurance of not being obliged to undertake the research process and that they are free to dismiss themselves from the data collection process. These information and assurances relayed to respondents encouraged them to be involved in the conduct of the study.

3.8 CHAPTER SUMMARY

The chapter three has dwelt extensively on the procedures that were adopted in conducting the research. The key methodological dimensions of this study include the usage of quantitative research strategy; data collection instrument design in which survey questionnaire was utilized; the distribution of the survey questionnaire was solely by face-to-face using snowball sampling to locate respondents who were mainly contractors and architects in the building sector of Accra. The retrieved data was analyzed using SPSS which churned out interesting results in its output for analysis in chapter four below.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION OF RESULTS

4.1 INTRODUCTION

In preceding chapters, significant literatures in view of study's objectives has been assessed and methodology adopted has been established. These were conducted to ensure that data gathered are of relevance to the study. This chapter presents analysis of gathered data and discussions into detail which is linked to reviewed literature to answer objectives of the study. The immediate part of the analysis was on respondent profile engaged in the conduct of the study. Moreover, the profile of respondent influence the data retrieved therefore it was deemed necessary to analyze their profile to ascertain how these attributes of the respondent will influence the research. The specific objectives of the study was analyzed in the second section of this chapter of the research which includes causes of poor construction quality in Ghana, potential solutions to improve construction quality and perspectives of designers and contractors on the causes of poor construction quality.

The research questionnaires retrieved which form a total of 52 questionnaires was engaged in the research analysis. From the retrieved data all the variables were rated by respondents therefore there were no missing values. The researcher attributes the high rate of response to constant follow ups on questionnaires for collection and also the ease of reading and understanding the questions by the respondents.

4.2 RESPONDENT PROFILE ANALYSIS

In research conduct, knowledge of respondent background is vital to establish the reliability and confidence in responses given by respondents. The conduct of respondent profile analysis helps to provide appreciative of respondents involved in the process of data collect. The results on the respondent background analysis are presented in Figure 4.1 to 4.3 below.

4.2.1 Profession of Respondents

Respondents' profession engaged in the conduct of the survey is summarized in Figure 4.1 below. Respondents were ask to indicate their profession so as to be certain that the questionnaires were completed by the respondents who were actually targeted. The targeted respondents were of only two profession that is the contractor and the architect/designer. The results of the analysis indicated that, 29 of the respondents were contractors which represents a percentage of 56% and the remaining 23 respondents were architect/designer which represents a percentage of 44%. This implies that contractors dominates architects in construction firms in Ghana.

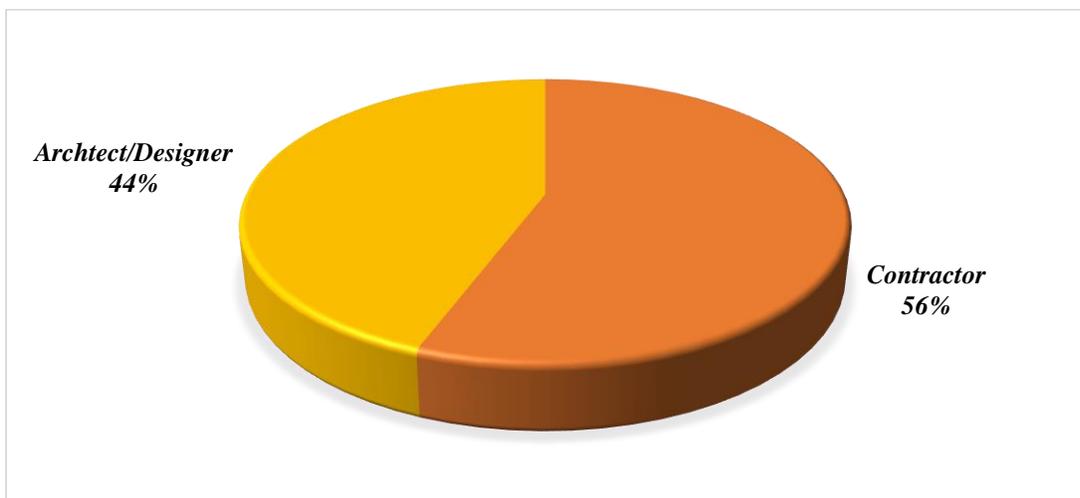


Figure 4.1: Profession of Respondents

4.2.2 Years of Experience of Respondents

Figure 4.2 summarizes the years of experience of respondents engaged in the conduct of the survey. Respondents were required to indicate their years of experience so as to be certain that the questionnaires were completed by the respondents who have gained enough experience in project management and therefore have been involved with project quality management. The results of the analysis of the years of experience of respondents indicated that, 24 of the respondent's years of experience were over 10years which represents a percentage of 46%. 21 of the respondents years of experience were between 6 -10years which represents a percentage of 40% and the remaining 7 of the respondents years of experience were between 1 -5years which represents a percentage of 14%. The results implies that respondents engaged in the survey have reasonable experience and a credible conclusion therefore is that respondents are experienced in construction activities.

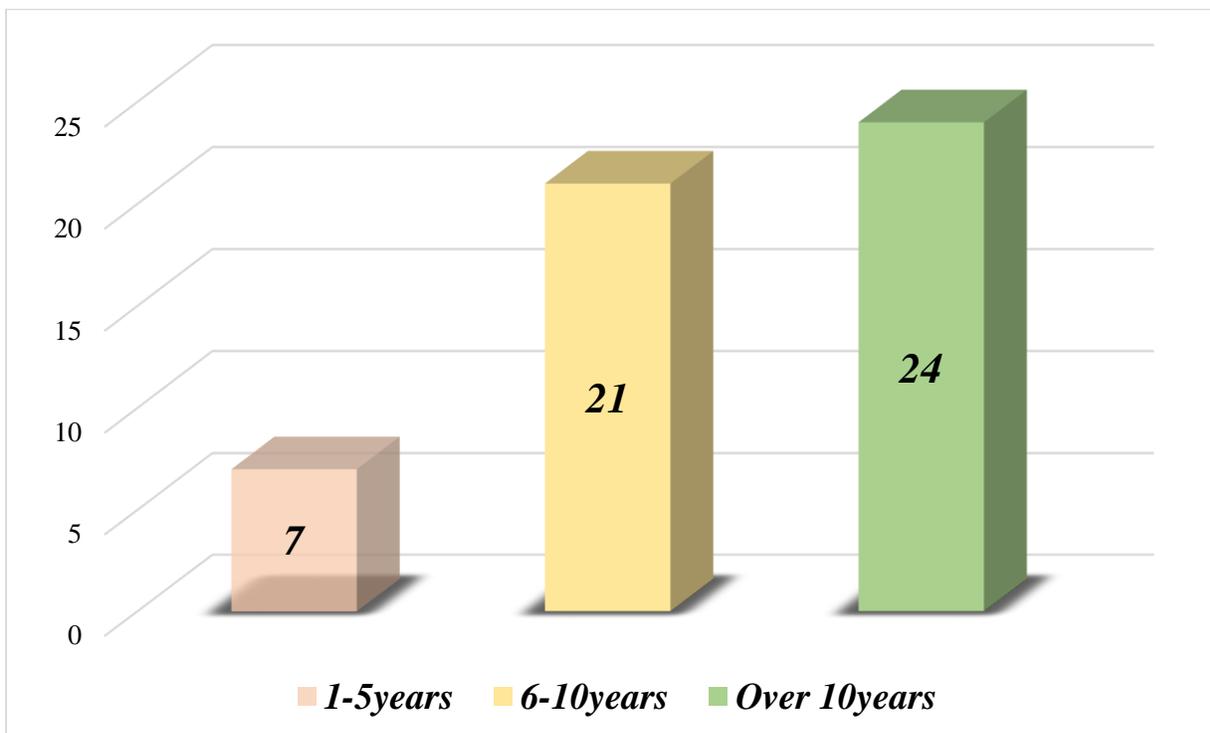


Figure 4.2: Years of Experience of Respondents

4.2.3 Sector of the Construction Industry of Respondents

Figure 4.3 summarizes the sector of the construction industry of respondents engaged in the conduct of the survey. Respondents were asked to indicate their sector of the construction industry so as to be certain that the questionnaires were completed by the respondents who have worked and gained enough experience in project management of the various construction sector and therefore have been involved with project quality management. The results of the analysis indicated that, 12 of the respondent's sector of the construction industry were residential which represents a percentage of 23%. 22 of the respondents sector of the construction industry were commercial and institutional which represents a percentage of 42% and the remaining 18 of the respondents sector of the construction industry were civil and transportation which represents a percentage of 35%. The results can be said that most construction firms operates in the commercial and institutional sector of the construction industry.

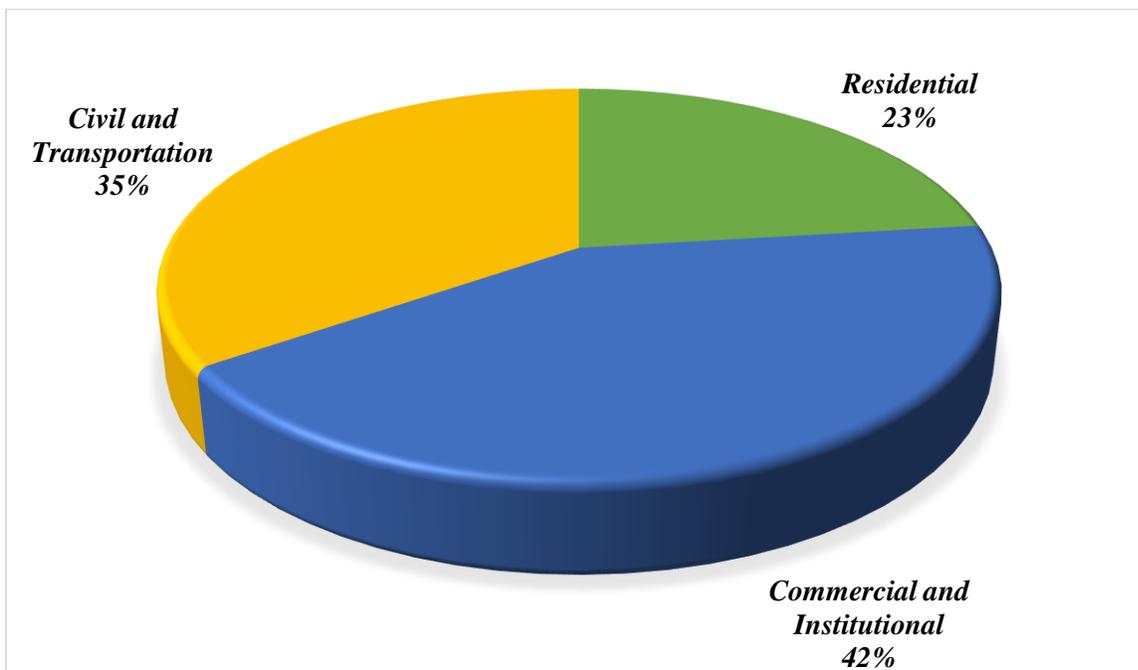


Figure 4.3: Sector of the Construction Industry of Respondents

**4.3 DESIGNERS AND CONTRACTORS EQUALLY CONSIDER DESIGN
QUALITY IMPORTANT IN SETTING THE OVERALL QUALITY OF
PROJECT**

Data retrieved from field survey on the first objective was subject to analysis to determine the contractors and designers views whether they equally consider design quality important in setting the overall quality of project. Also it considered that knowledge of this area will present a basis to gain understanding of what accounts for overall quality of construction projects. Subsequently, contractors and designers were questioned to rate the level of importance of design quality in setting the overall quality of project. The Likert scale was rated from 1 to 5; and 1 signifies Unimportant, 2 signifies Slightly important, 3 signifies Moderately important, 4 signifies Important and 5 signifies Very important. Table 4.3.1 shows a summary of the descriptive statistics conducted to evaluate the evident importance in the responses of the contractors and designers based on the frequencies.

Table 4.3.1: Importance of design quality in setting the overall quality of project

*Note: * shows majority of respondents*

<i>Level of importance</i>	<i>Unimportant</i>	<i>Slightly important</i>	<i>Moderately important</i>	<i>Important</i>	<i>Very important</i>	<i>Total</i>
Number						
Contractors	-	-	-	-	29	29
Designers	-	-	-	-	23	23
% response						
Contractors	-	-	-	-	100.0*	100.0
Designers	-	-	-	-	100.0*	100.0

From table 4.3.1 it can be ascertained from the analysis that the total number of 29 contractors surveyed are all in agreement that design quality is very important in setting overall quality of construction projects which represents a response percentage of 100%. Also, it can be ascertained from the analysis that the total number of 23 Architect/designers surveyed are all in agreement that design quality is very important in setting overall quality of construction projects which represents a response percentage of 100%. From the analysis of the contractor's and designer's perspective, it can be concluded that design quality is very important in setting overall quality of construction projects. More so, a hundred percent of respondents answered this question, hence a true reflection of the standard perception of targeted respondents under this survey.

This further reiterates from the constructors' point of view that, quality management of projects is a means of meeting the required standard of projects in order to gain customer satisfaction which may enhance continuous effectiveness and subsistence in business (Tan and Abdul-Rahman, 2005).

4.4 CAUSES OF POOR CONSTRUCTION QUALITY IN GHANA

This section of the questionnaire sought to find the views of respondents on the causes of poor construction quality in Ghana. Respondent's were required to rate the variables identified in terms of their impact on quality of construction projects from a Likert scale rating of 1 to 5. The table below depicts a mean score ranking of responses obtained from questionnaires retrieved from respondents;

Table 4.4.1: Descriptive statistics of the causes of poor construction quality in Ghana
Ranking: [No impact - 1, Low impact -2, Moderate impact -3, High impact -4 and Very high impact -5]

Causes of poor construction quality	Mean Score	Std. Deviation	Ranking
Lack of proper supervision from architects	4.923	0.2691	1st
Use of low quality materials	4.904	0.2977	2nd
Change orders	4.885	0.3226	3rd
Poor communication among project participants	4.846	0.3643	4th
Poor planning and scheduling	4.827	0.3820	5th
Lack of skilled labor	4.769	0.4254	6th
Poor site management	4.750	0.4372	7th
Defective designs	4.731	0.4478	8th
Poor project estimating	4.712	0.4575	9th
Inadequate building codes and standards	4.692	0.4660	10th
Lack of contractor's quality control plan	4.673	0.4737	11th
Poor construction methods	4.615	0.5655	12th
Lack of innovation in design	4.558	0.6390	13th
Lack of constructor's input in design	4.500	0.6716	14th
Poor or lack of safety programs	4.462	0.7266	15th
Lack of inspection from building officials	4.423	0.7501	16th

Source: Field data, 2018

Responses retrieved from participants displayed in the table above indicates that lack of proper supervision from architects ranked first with a mean score of 4.923, this shows that lack of proper supervision has a high impact on the quality of construction projects in Ghana. From table 4.4.1 above it can be ascertained from the analysis that there were no missing numbers and that all the variables were rated by respondents thereby having a total number of 52 each in table 4.4.1 above. More so, in terms of the rating from the Likert scale of 1 to 5, the minimum rating by respondents which represents moderate impact was 3 and the maximum rating by respondents which represents Very high impact was 5. Also all the variables were deemed to have very high impact on project

quality by some respondents thereby all having a maximum rating of 5. This can be concluded that the various respondents in one way or the other finds the identified variable to have very high impact based on their experience. In addition from the rating there were no rating of 1 and 2 which represents No impact and Low impact respectively by respondents. This can be said that, respondents finds the variables identified as causes of poor construction quality in Ghana to be at least moderately impactful.

Further, in terms of their mean scores all the variables scored above the average mean score of 2.5 which indicates that the variables identified as the causes of poor construction quality in Ghana are rated above the level of high impact based on the minimum mean of “4.423” and a maximum mean of “4.923”. This may also be considered that respondents are in agreement with the variables identified as been a source of their past quality failure experienced in project executed.

More so, the standard deviation of a minimum value of “0.2691” and a maximum of “0.7501” indicates their closeness to zero and to each other and therefore are not too dispersed or deviated from each other which makes the respondents homogenous group, thereby shares similar ideas on the causes of poor construction quality in Ghana.

However, from the ranking in table 4.4.1 it can be concluded that Lack of proper supervision from architects has the most influential impact on poor construction quality in Ghana with the highest mean of “4.923” and Lack of inspection from building officials which was ranked 16th has the least influential impact on poor construction quality in Ghana with the lowest mean of “4.423”. Supported by these findings were the studies by Chan and Tam (2000) that propose factors of project team members that causes poor quality performance of construction projects includes: Lack of proper supervision from architects; Use of low quality material; Poor communication among

project participants; Poor planning and scheduling and factors of client that causes poor quality performance of construction projects include: Change orders.

4.5 DIFFERENCE IN THE PERSPECTIVES OF DESIGNERS AND CONTRACTORS ON THE CAUSES OF POOR CONSTRUCTION QUALITY

Data retrieved from field survey on the second objective was use for the analysis of the third objective. The data was subject to analysis to determine the contractors and designers views to ascertain whether there are differences in the perspective of designers and contractors on the causes of poor construction quality. From the analysis above in table 4.3.1 above it was established that the standard deviation of a minimum value of “0.2691” and a maximum of “0.7501” indicates their closeness to zero and to each other and therefore are not too dispersed or deviated from each other which makes the respondents homogenous group, thereby shares similar ideas on the causes of poor construction quality in Ghana. It can therefore be concluded that both designers and contractors have similar perspectives on the causes of poor construction quality. However, it’s necessary to ascertain the differences in responses from both the contractors and designers individually. Table 4.5.1 and Table 4.5.2 shows a summary of the descriptive statistics conducted to evaluate mean

Table 4.5.1: Descriptive statistics of the causes of poor construction quality in Ghana from the contractor’s perspective

Causes of poor construction quality contractor’s perspective	Mean Score	Std. Deviation	Ranking
Lack of proper supervision from architects	4.966	0.1857	1 st
Use of low quality materials	4.931	0.2579	2 nd
Poor communication among project participants	4.897	0.3099	3 rd
Change orders	4.828	0.3844	4 th
Poor planning and scheduling	4.793	0.4123	5 th
Lack of skilled labor	4.690	0.4708	6 th
Poor site management	4.655	0.4837	7 th
Defective designs	4.621	0.4938	8 th
Poor project estimating	4.586	0.5012	9 th
Inadequate building codes and standards	4.552	0.5061	10 th
Lack of contractor’s quality control plan	4.517	0.5085	11 th
Poor construction methods	4.414	0.6278	12 th
Lack of constructor’s input in design	4.310	0.7123	13 th
Lack of innovation in design	4.207	0.7260	14 th
Poor or lack of safety programs	4.138	0.7894	15 th
Lack of inspection from building officials	4.069	0.7987	16 th

Table 4.5.2: Descriptive statistics of the causes of poor construction quality in Ghana from the designer’s perspective

Causes of poor construction quality designer’s perspective	Mean Score	Std. Deviation	Ranking
Use of low quality materials	4.957	0.2085	1 st
Change orders	4.913	0.2881	2 nd
Poor communication among project participants	4.870	0.3444	3 rd
Lack of proper supervision from architects	4.783	0.4217	4 th
Poor planning and scheduling	4.739	0.4490	5 th
Lack of skilled labor	4.609	0.4990	6 th
Poor site management	4.565	0.5069	7 th
Defective designs	4.522	0.5108	8 th
Poor project estimating	4.478	0.5108	9 th
Inadequate building codes and standards	4.435	0.5069	10 th
Lack of innovation in design	4.391	0.4990	11 th
Poor construction methods	4.261	0.6192	12 th
Lack of contractor’s quality control plan	4.130	0.6944	13 th
Lack of constructor’s input in design	4.000	0.6742	14 th
Poor or lack of safety programs	3.913	0.7332	15 th
Lack of inspection from building officials	3.826	0.7168	16 th

From table 4.5.1 and table 4.5.2 above it can be ascertained from the analysis that there were no missing numbers and that all the variables were rated by contractors and designers thereby having a total number of 29 and 23 respectively in each table. More so, in terms of the rating from the Likert scale of 1 to 5, the minimum rating by both contractors and designers which represents moderate impact was 3 and the maximum rating by both contractors and designers which represents Very high impact was 5. Also all the variables were deemed to have very high impact on project quality by some contractors and designers thereby all having a maximum rating of 5.

This can be concluded that both the contractors and designers in one way or the other finds the identified variable to have very high impact based on their experience. In addition from the rating there were no rating of 1 and 2 which represents No impact and Low impact respectively by both the contractors and designers. This can be said that, contractors and designers finds the variables identified as causes of poor construction quality in Ghana to be at least moderately impactful.

Further, in terms of their mean scores all the variables scored above the average mean score of 2.5 which indicates that the variables identified as the causes of poor construction quality in Ghana are rated above the level of high impact based on the minimum mean of “4.138” and a maximum mean of “4.966” from the contractor’s perspective. Also, a minimum mean of “3.913” and a maximum mean of “4.957” from the designer’s perspective. This may also be considered that both the contractors and designers are in agreement with the variables identified as been a source of their past quality failure experienced in project executed. More, the differences in their means can be attributed to their differences in number i.e., a number of 29 contractors and a number of 23 designers and can also be attributed to the differences in their responses. Below are a summary of their perspective of the various identified variables as the causes of poor construction quality in Ghana.

From the analysis, they share different perceptives on the following causes of poor construction quality: “Lack of proper supervision from architects; Use of low quality materials and Change orders which were ranked 1st, 2nd and 4th respectively by contractors. While, “Use of low quality materials; Change orders; Poor communication among project participants; and Lack of proper supervision from architects were ranked 1st, 2nd and 4th respectively by designers. More so, “Lack of innovation in design” was ranked 14th by contractors while designers ranked it 11th. Further, “Lack of constructor’s input in design” was ranked 13th by contractors while designers ranked it

14th. “Lack of contractor’s quality control plan” was ranked 11th by contractors while designers ranked it 13th.

However they share the same perspective on the following causes of poor construction quality: Poor communication among project participants; Poor planning and scheduling; Lack of skilled labor; Defective designs; Poor construction methods and Poor or lack of safety programs were ranked 3rd, 5th, 6th, 8th, 12th and 15th respectively by both contractors and designers. It can be concluded that contractors and designers have same perspective to the causes of poor construction quality in Ghana. However, they show some differences in their perspective according to their impact on construction quality based on their respective experiences. The results obtained reaffirms that of Chan and Tam(2000) as the use of quality material, poor communication among project stakeholders, poor planning and scheduling and change orders were ranked as the major causes of poor construction quality.

4.6 POTENTIAL SOLUTIONS TO IMPROVE CONSTRUCTION QUALITY

Data retrieved from field survey on the fourth objective was subject to analysis to determine the contractors and designers views on potential solutions to improve construction quality. Also it considered that knowledge of this area will present a basis to gain understanding of how poor quality construction projects could be prevented. Subsequently, contractors and designers were questioned to rate the variables identified in terms of their importance in improving quality of construction projects. The Likert scale was rated from 1 to 5; and 1 signifies Unimportant, 2 signifies Slightly important, 3 signifies Moderately important, 4 signifies Important and 5 signifies Very important. Table 4.6.1 shows a summary of the descriptive statistics conducted to evaluate the evident importance of the identified variables on project quality from the responses of the contractors and designers based on the mean and standard deviation.

Table 4.6.1: Descriptive statistics of the potential solutions to improve construction quality from contractors and designers perspective

Solutions to improve construction quality	Mean Score	Std. Deviation	Ranking
Good site working conditions, with proper inspection	4.827	0.3820	1st
Constructability of design	4.788	0.4124	2nd
Competence and experience of project team members	4.750	0.4372	3rd
Quality materials in construction	4.692	0.4660	4th
Efficient teamwork and cooperation	4.635	0.5950	5th
Quality drawings and specifications	4.500	0.6716	6th
Management commitment to quality	4.365	0.7677	7th
Effective quality control plan	4.115	0.8321	8th
Effective communication among project team members	3.962	0.8393	9th
Quality training and awareness	3.904	0.8227	10th
Favorable and effective construction methods	3.846	0.8491	11th
Quality standards and codes	3.827	0.8568	12th
Suitable, save and effective equipment's	3.788	0.8708	13th

From table 4.6.1 above it can be ascertained from the analysis that there were no missing numbers and that all the variables were rated by respondents thereby having a total number of 52 each in table 4.6.1 above. More so, in terms of the rating from the Likert scale of 1 to 5, the minimum rating by respondents which represents moderately important was 3 and the maximum rating by respondents which represents Very important was 5.

Also all the variables were deemed to have very much importance to improvement of project quality by some respondents thereby all having a maximum rating of 5. This can be concluded that

the various respondents in one way or the other finds the identified variables to have very much importance to project quality improvement based on their experience. In addition, from the rating there were no rating of 1 and 2 which represents Unimportant and Slightly important respectively by respondents. This can be said that, respondents finds the variables identified as potential solutions to improve construction quality to be at least moderately important.

Further, in terms of their mean scores all the variables scored above the average mean score of 2.5 which indicates that the variables identified as potential solutions to improve construction quality are rated above the level of moderately important based on the minimum mean of “3.788” and a maximum mean of “4.827”. This may also be considered that respondents are in agreement with the variables identified as been a source of their past quality improvement solution experienced in project executed.

More so, the standard deviation of a minimum value of “0.3820” and a maximum of “0.8708” indicates their closeness to zero and to each other and therefore are not too dispersed or deviated from each other which makes the respondents homogenous group, thereby shares similar ideas on the potential solutions to improve construction quality .

However, from the ranking in table 4.6.1 above it can be concluded that Good site working conditions, with proper inspection has the most influential importance to improving construction quality with the highest mean of “4.827” and Suitable, save and effective equipment’s which was ranked 13th has the least influential importance on improving construction quality with the lowest mean of “3.788”. Supported by these findings were the studies by Harris and McCaffer (1995) that propose potential solutions to improve construction quality includes: Good site working conditions, with proper inspection; Constructability of design; Competence and experience of project team members; Quality materials in construction; Efficient teamwork and cooperation.

4.7 DISCUSSIONS

4.7.1 IMPORTANCE OF CONSTRUCTION QUALITY DESIGN

The quality of project can simply be referred to as meeting the expectations and project desires of customers. It is also referred as abiding by the specifications and requirements of a project. The user views the quality of a project as simply appeasement with performance, appearance and reliability of the project in terms of cost. However, to the designers, it is believed that quality is measured by the aesthetics of the facilities they design (Collins, 1996).

The researcher discusses in this section the designer and contractors' views to ascertain whether they equally consider design quality as a significant tool in setting the overall quality of a project. From the data presented earlier in section 4.3, both the designers and the contractors agreed that the design quality is very important in setting the overall quality of construction projects. This was proven by their response percentage of 100 by both designers and contractors when they responded that the design quality in setting the overall quality of projects was *very important*.

This particular finding is reiterated in the findings of Tan and Abdul-Rahman (2005) that from the constructors' point of view, quality management of projects was very substantial and as a result is a means of meeting the required standard of projects in order to gain customer satisfaction which may enhance continuous effectiveness and subsistence in business.

4.7.2 CAUSES OF POOR CONSTRUCTION QUALITY

The causes of poor construction as retrieved from the field survey are discussed by the researcher in this section. From the data presented in section 4.4, the contractors and designers agreed that Lack of proper supervision from architects, use of low-quality materials, change orders and poor communication among project participants has the most influential impact on poor construction

quality in Ghana while Lack of inspection from building officials was least ranked and therefore has little influential impact on poor construction quality in Ghana. Supported by these findings were the studies by Chan and Tam (2000) that propose factors of project team members that causes poor quality performance of construction projects includes: Lack of proper supervision from architects; Use of low-quality material; Poor communication among project participants; Poor planning and scheduling and factors of client that causes poor quality performance of construction projects include: Change orders.

4.7.3 IMPROVING CONSTRUCTION QUALITY

The analysis of this section was to determine the possible solutions determined by the contractors and designers in order to improve upon construction quality. From the data presented in section 4.6, the contractors and designers concluded that, Good site working conditions, with proper inspection, constructability of design, competence and experience of project team members were ranked as the most influential importance to improving construction quality with Suitable, save and effective equipment's ranked as the least influential importance on improving construction quality. Supported by these findings were the studies by Harris and McCaffer (1995) that proposed potential solutions to improve construction quality which includes: Good site working conditions, with proper inspection; Constructability of design; Competence and experience of project team members; Quality materials in construction; Efficient teamwork and cooperation.

4.8 CHAPTER SUMMARY

Data obtained from field survey was subject to analysis and discussion in this chapter. This chapter of the research was closed with descriptive analysis of potential solutions to improve construction project quality in Ghana.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5. 5.1 INTRODUCTION

The construction firms in Ghana and as such developing countries need to be proactive in dealing with constraints to construction project performance by adopting measures to enhance project quality performance. The study has explored and determined if designers and contractors equally consider design quality important in setting the overall quality of project. More so, it has identify the causes of poor construction quality in Ghana, determine whether there are difference in the perspectives of designers and contractors on the causes of poor construction quality and identify potential solutions to improve construction quality.

The preceding chapters have explored the theoretical, procedural and practical approaches to address the objectives and research aim. This chapter represents final chapter of the research which provides summary of the whole work and suggest recommendations for policy making in Ghana to magnify construction industry productivity.

6. 5.2 REVIEW OF OBJECTIVES

The study was set off with the principal aim to investigate factors influencing construction quality in Ghana from the perspectives of the designer and contractor. Four objectives were set to attain the research aim stated. The objectives were attained through reviews of literature to obtain secondary data which were further undertaken through field survey with the use of questionnaire to solicit primary data. The objectives have been discussed below.

1. To determine whether designers and contractors equally consider design quality important in setting the overall quality of project.

The first objective was attained by administering questionnaires to contractors and designers to solicit their views whether designers and contractors equally consider design quality important in setting the overall quality of project. Their responses were analyzed using descriptive statistics based on their frequencies. From the analysis it was brought to light that both designers and contractors equally consider design quality important in setting the overall quality of project.

2. To identify the causes of poor construction quality in Ghana.

The second objective was attained by reviewing literatures on construction project quality which covered a number of relevant issues. Questionnaires were administered to contractors and designers to solicit their views on the variables identified from the literature review as causes of poor construction quality in Ghana. Their responses were analyzed using descriptive statistics based on their mean and standard deviation. From the analysis “Lack of proper supervision from architects” obtained the most influential impact on poor construction quality in Ghana and “Lack of inspection from building officials” which was ranked 16th obtained the least influential impact on poor construction quality in Ghana.

3. To determine whether there are difference in the perspectives of designers and contractors on the causes of poor construction quality.

The third objective was attained by making reference from the analysis in the second objective above which established that the responses from the designers and contractors were homogenous which indicates that they share similar ideas on the causes of poor construction quality with their

standard deviation not too dispersed or deviated from each other. However, it's was necessary to ascertain the differences in responses from both the contractors and designers individually. The analysis concluded that contractors and designers have similar perspective to the causes of poor construction quality in Ghana. However, they share some differences according to their impact on construction quality base on their respective experiences.

4. To explore potential solutions to improve construction quality.

The fourth objective was attained by reviewing literatures on construction project quality which covered a number of relevant issues. Questionnaires were administered to contractors and designers to solicit their views on the variables identified from the literature review as potential solutions to improve construction quality. Their responses were analyzed using descriptive statistics based on their mean and standard deviation. From the analysis “Good site working conditions, with proper inspection” obtained the most influential importance in improving construction quality and “Suitable, save and effective equipment’s” which was ranked 13th obtained the least influential importance in improving construction quality.

7. 5.3 RECOMMENDATIONS

In the construction industry, projects are mostly anticipated to establish an equilibrium amongst project time, cost and quality. Project's quality may be referred to as satisfying a project's functional and aesthetic desires. Quality in construction may be referred to achieving designer, constructor and owner project desires as well as satisfying regulatory agencies. From a construction company point of view, quality management of projects is a means of meeting the

required standard of projects in order to gain customer satisfaction which may enhance continuous effectiveness and subsistence in business (Tan and Abdul-Rahman, 2005).

Therefore it can be deduced that in construction, quality performance has its basis on end product and requires confirmation of awareness of quality during execution and outcome by project team. The improvement of performance of quality is expected to enhance contractor's productivity and profitability as well as satisfying client's requirements. According to Love *et al.* (1999) the absence of it could end in regular changes, omission and errors. Therefore, according to Josephson *et al.* (2002) the absence of quality engagement throughout construction supply-chain could end in poor quality operations. Moreover, in construction projects, the aspects of productivity and performance can be affected negatively due to poor quality management.

Therefore for Ghana to be able to accomplish its developmental goals on delivering quality projects, lots of investment are required. In respect of this, the following recommendations to ensure construction quality are made:

- Designers must be encouraged to put in their best during the designing stage of construction projects since design quality is important in setting the overall quality of a project.
- Contractors must also be engaged in designing stage of project to contribute to feasibility and constructability of project design.
- Management in the construction industry should establish a commitment to construction quality through quality training, awareness and education on favorable and effective construction methods
- Establishment of efficient teamwork and cooperation among project stakeholders at the conception of project through effective communication among project team members and rapid dissemination of project information such as quality standards and codes.

- All construction industries in Ghana are entreated to use suitable, save and effective equipment's and quality materials in their operations to enhance effective quality management.

8. 5.4 LIMITATIONS OF THE RESEARCH

The study was bound to some limitations likewise other study's conducted. The limitation in this study is anticipated to give foundation for research work that may be conducted in the future. The study limits its scope to designers and contractors in the Accra metropolitan assemblies in Ghana. More so, the engagement of a relatively small sample size for the research could have been enhanced on sample size which is huge say, hundred and over, for the deployed statistical tools to be robust.

However, this would not invalidate conclusions that were drawn, given that relevant preliminary test which is associated with adequacy of the sample size proved favorable to proceed the analysis and finding can be generalized. Further, published literatures were used in the study's analysis and conclusions drawn to this study were based on data and results retrieved from respondents using questionnaires.

9. 5.5 DIRECTION FOR FUTURE RESEARCH

The study exposed a number of areas which requires research attention. Recommendations made for future research are as follows:

- Significance of project quality management in the Ghanaian construction industry
- The effect of poor quality management on construction project performance
- Determinants of effective quality management in infrastructural projects

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APPENDIX

QUESTIONNAIRE DESIGN

Topic:

Factors Influencing Construction Quality in Ghana: Comparison of Designer's and Contractor's Perspectives

This study is to determine if designers and contractors equally consider design quality important in setting the overall quality of project, identify the causes of poor construction quality in Ghana, determine whether there are difference in the perspectives of designers and contractors on the causes of poor construction quality and identify potential solutions to improve construction quality. Please kindly respond to the questions by ticking the appropriate box for each item. Please note that all information provided will be strictly confidential.

Thank you for your assistance.

BY

RICHARD K. DZIDZORNU

1. Please indicate your profession:
 - a. Contractor
 - b. Designer/Architect

2. Please indicate your years of experience:
 - a. 1 – 5 years
 - b. 6 – 10 years
 - c. Over 10 years

3. Please select your sector of the construction industry
 - a. Residential
 - b. Commercial and institutional
 - c. Civil and Transportation

4. Please rate the following on a scale of 1 – 5 where 1 = unimportant and 5 = very important

	Unimportant	Slightly important	Moderately important	Important	Very important
What is the importance of design quality to the overall quality of the project?					

5. Please rank the following factors in terms of their impact on the quality of construction projects.

Factors that hinders project quality	No impact	Low impact	Moderate impact	High impact	Very high impact
Defective designs					
Inadequate building codes and standards					
Lack of innovation in design					
Lack of constructor's input in design					
Lack of contractor's quality control plan					
Poor planning and scheduling					
Poor project estimating					
Poor or lack of safety programs					
Poor site management					
Poor communication among project participants					
Poor construction methods					

Lack of inspection from building officials					
Lack of proper supervision from architects					
Use of low quality materials					
Lack of skilled labor					
Change orders					

6. Please rank the following factors in terms of their importance in the improvement of quality of construction projects.

Factors that improve project quality	Unimportant	Slightly important	Moderately important	Important	Very important
Quality drawings and specifications					
Quality standards and codes					
Constructability of design					
Management commitment to quality					
Quality training and awareness					
Good site working conditions, with proper inspection					
Suitable, save and effective equipment's					
Quality materials in construction					
Efficient teamwork and cooperation					
Competence and experience of project team members					
Effective communication among project team members					
Effective quality control plan					
Favorable and effective construction methods					